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PRIORITY DOCUMENT

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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION under 37 C.F.R. § 1.53(c).

DOCKET NUMBER	1960.143 PV	Type a plus sign (+) inside this box.	+

INVENTOR(s)/APPLICANT(s)

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TITLE OF THE INVENTION (280 characters max)

RADIATION SOURCE ASSEMBLY AND RADIATION SOURCE MODULE CONTAINING SAME

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ENCLOSED APPLICATION PARTS ***(check all that apply)***

[X] Specification Number of Pages 11 [ ] Small Entity Statements

[X] Drawings Number of Sheets 3 [ ] Other (specify) ______

METHOD OF PAYMENT ***(check one)***

	PROVISIONAL FILING FEE AMOUNT ($)
[X] A check or money order is enclosed to cover the Provisional filing fees [ ] The Commissioner is hereby authorized to charge filing fees and credit Deposit Account Number: 06-1205	$150.00

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are:

Respectfully submitted,

SIGNATURE  DATE September 3, 1999

TYPED or PRINTED NAME MARK A. WILLIAMSON REGISTRATION NO. 33,628
(if appropriate)

☐ Additional inventors are being named on separately numbered sheets attached hereto.

PROVISIONAL APPLICATION FOR PATENT FILING ONLY

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Gowlings Ref: T8465247US

FINAL VERSION

Applicant/Inventor: Richard Pearcey

Title: Radiation Source Assembly and Radiation Source Module Containing Same

Assignee: Trojan Technologies Inc.

JURISDICTION: United States
DATE: September 3, 1999
INTELLECTUAL PROP:\206866_2

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

In one of its aspects, the present invention relates to a radiation source assembly. In another of its aspects, the present invention relates to a radiation source module comprising a novel radiation source assembly having incorporated therein an optical radiation sensor.

DESCRIPTION OF THE PRIOR ART

Optical radiation sensors are known and find widespread use in a number of applications. One of the principal applications of optical radiation sensors is in the field of ultraviolet radiation fluid disinfection systems.

It is known that the irradiation of water with ultraviolet light will disinfect the water by inactivation of microorganisms in the water, provided the irradiance and exposure duration are above a minimum "dose" level (often measured in units of microWatt seconds per square centimetre). Ultraviolet water disinfection units such as those commercially available from Trojan Technologies Inc. under the tradenames UV700 and UV8000, employ this principle to disinfect water for human consumption. Generally, water to be disinfected passes through a pressurized stainless steel cylinder which is flooded with ultraviolet radiation. Large scale municipal waste water treatment equipment such as that commercially available from Trojan Technologies Inc. under the trade-names UV3000 and UV4000, employ the same principal to disinfect waste water. Generally, the practical applications of these treatment systems relates to submersion of treatment module or system in an open channel wherein the wastewater is exposed to radiation as it flows past the lamps. For further discussion of fluid disinfection systems employing ultraviolet radiation, see any one of the following:

United States Patent 4,482,809,
United States Patent 4,872,980,
United States Patent 5,006,244,

United States Patent 5,418,370,
United States Patent 5,539,210, and
United States Patent 5,590,390.

In many applications, it is desirable to monitor the level of ultraviolet radiation present within the water under treatment. In this way, it is possible to assess, on a continuous or semi-continuous basis, the level of ultraviolet radiation, and thus the overall effectiveness and efficiency of the disinfection process.

It is known in the art to monitor the ultraviolet radiation level by deploying one or more passive sensor devices near the operating lamps in specific locations and orientations which are remote from the operating lamps. These passive sensor devices may be photodiodes, photoresistors or other devices that respond to the impingent of the particular radiation wavelength or range of radiation wavelengths of interest by producing a repeatable signal level (in volts or amperes) on output leads.

Conventional ultraviolet disinfection systems often incorporate arrays of lamps immersed in a fluid to be treated. Such an arrangement poses difficulties for mounting sensors to monitor lamp output. The surrounding structure is usually a pressurized vessel or other construction not well suited for insertion of instrumentation. Simply attaching an ultraviolet radiation sensor to the lamp module can impede flow of fluid and act as attachment point for fouling and/or blockage of the ultraviolet radiation use to treat the water. Additionally, for many practical applications, it is necessary to incorporate a special cleaning system for removal of fouling materials from the sensor to avoid conveyance of misleading information about lamp performance.

It would be desirable to have a radiation source assembly and module containing same which incorporated an optical radiation sensor that does not interfere with the flow of water or exposure of the fluid being treated to radiation.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a novel radiation source module which obviates or mitigates at least one of the above-mentioned disadvantages of the prior art.

It is another object of the present invention to provide a novel radiation source assembly which obviates or mitigates at least one of the above-mentioned disadvantages of the prior art.

Accordingly, in one of its aspects, the present invention provides a radiation source module for use of fluid treatment system, the module comprising:

a frame having a first support member;

at least one radiation source assembly extending from and in engagement (preferably sealing engagement) with a first support member, the at least one radiation source assembly comprising at least one radiation source disposed within a protective sleeve; and

an optical radiation sensor disposed within the protective sleeve.

In another of its aspects, the present invention provides a radiation source assembly for use in a radiation source module, the radiation source assembly comprising at least one radiation source and an optical radiation sensor, both the at least one radiation source and the optical radiation sensor being disposed within a protective sleeve.

Thus, the present inventor has discovered that, by placing an optical radiation sensor within a protective sleeve commonly employed in combination with a radiation source, a number of advantages accrue. For example, the need to periodically clean the surface of the sensor from fouling materials is obviated since the sensor is disposed within the protective sleeve. This is particularly advantageous when the radiation source assembly is used in conjunction with a cleaning system (e.g., one of the cleaning systems in the '370, '210 and/or '390 patents referred to above). Specifically, since the cleaning system serves the purpose of removing fouling materials from the protective sleeve to allow for optimum dosing of radiation, a separate cleaning system for the sensor is not required. Further, since the optical radiation sensor is disposed within an existing element (the protective sleeve) of the radiation source module, incorporation of the sensor in the module does not result in any additional

hydraulic head loss and/or does not create a "catch" for fouling materials. Other advantages will be apparent to those skilled in the art.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the present invention will be described with reference to the accompanying drawings, in which:

Figure 1 is a side elevation of an embodiment of the present radiation source module;

Figure 2 is a sectional view of a trio of radiation source modules including the radiation source module illustrated in Figure 1; and

Figure 3 illustrates an enlarged sectional view taken along line A-A in Figure 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to Figures 1-2, a radiation source module 100 is illustrated. Radiation source module 100 comprises a pair of support legs 105,110 depending from a crosspiece 115. Disposed between support legs 105,110 are a trio of radiation source assemblies 120,125,130. Each radiation source assembly 120,125,130 comprises a radiation source 140 (e.g., an ultraviolet emitting lamp) disposed within a protective sleeve 145 (e.g., typically made of quartz). The design of support legs 105,110 and radiation source assemblies 120 is preferably as is described in United States Patents 4,872,980 and 5,006,244 referred to hereinabove.

Preferably, each protective sleeve 145 is connected to support leg 105 via a coupling nut 150. The details of this connection are preferably as set out in copending United States patent application S.N. 09/258,142 (Traubenberg et al.).

With reference to Figures 2 and 3, radiation source assembly 125 comprises an optical radiation sensor 150 disposed within protective sleeve 145 adjacent support leg 110. Optical sensor 150 comprises a window 155(optional) which receives incident radiation and passes this radiation into a body 160 that contains a photodiode (not shown) or other radiation sensor material as described above. A signal related to the amount of radiation sensed is then sent from body 160 through a lead 165 which is connected to a conventional

control system which allows the user to ascertain the level of radiation sensed compared to a predetermined benchmark.

Preferably, sensor 160 is oriented within protective sleeve 145 in a manner that it receives incident radiation from at least one, preferably both, of adjacent radiation source assemblies 120,130. In other words, it is preferred that sensor 150 not receive incident radiation from the radiation source contained within the same protective sleeve in which sensor 150 is housed.

The sensor itself may be chosen from conventional sensors. For example, a suitable sensor is commercially available from UDT Sensors Inc. (Hawthorne, California).

As shown in Figure 2, radiation source module 100 may be a member of an array of radiation source modules which do not contain an optical radiation source sensor. Thus, the trio of radiation source modules illustrated in Figure 2 could be placed in an open channel as shown in United States Patents 4,872,980 and 5,006,244 and used to treat wastewater as set out in those patents.

While the present invention has been described with reference to preferred and specifically illustrated embodiments, it will of course be understood by those skilled in the arts that various modifications to these preferred and illustrated embodiments may be made without the parting from the spirit and scope of the invention. For example, while the present invention has been illustrated with reference to radiation source modules similar in general design to those taught in United States Patents 4,872,980 and 5,006,244, it is possible to employ the present radiation source assembly in a module such as the one illustrated in United States Patents 5,418,370 , 5,539,210 and 5,590,390 - i.e., in a module having a single support for one or more elongate source assemblies extending therefrom.. Further, it is possible to employ the present radiation source assembly in a fluid treatment device such as those commercially available from Trojan Technologies Inc. under the tradenames UV700 and UV8000. Still, further, while, in the embodiments illustrated and described above, the optical sensor is disposed at the end of the projective sleeve opposite the end where electrical connections for the lamp are located, it possible to locate the optical radiation sensor at the same end as the electrical connections for the lamp thereby allowing

for use of the protective sleeve having one closed end. Still further, it is possible to utilize an optical radiation source sensor disposed between two radiation sources, all of which are disposed within a protective sleeve. Other modifications which do not depart from the spirit and scope of the present invention will be apparent to those skilled in the art.

All publications, patents and patent applications referred to herein are incorporated by reference in their entirety to the same extent as if each individual publication, patent or patent application was specifically and individually indicated to be incorporated by reference in its entirety.

What is claimed is:

1. A radiation source module for use of fluid treatment system, the module comprising:

a frame having a first support member;

at least one radiation source assembly extending from and in engagement with a first support member, the at least one radiation source assembly comprising at least one radiation source disposed within a protective sleeve; and

an optical radiation sensor disposed within the protective sleeve.

2. The radiation source module defined in claim 1, wherein the frame further comprises a second support member opposed to and laterally spaced from the first support member, the at least one radiation source assembly disposed between each of the first support member and the second support member.

3. The radiation source module defined in claim 2, wherein the frame further comprises a third support member interconnecting the first support member and the second support member.

4. The radiation source module defined in any one of claims 1-3, wherein the frame further comprises a ballast for controlling the at least one radiation source.

5. The radiation source module defined in any one of claims 1-4, wherein the first support member comprises a hollow passageway for receiving a lead wire for conveying electricity to the at least one radiation source.

6. The radiation source module defined in any one of claims 1-5, wherein the protective sleeve comprises a quartz sleeve.

7. The radiation source module defined in any one of claims 1-6, wherein the radiation source module comprises a plurality of radiation source assemblies at least one radiation source assembly comprising the optical radiation sensor disposed within the protective sleeve.

8. The radiation source module defined in claim 7, wherein the radiation source module comprises at least one radiation source assembly having no optical radiation sensor.

9. The radiation source module defined in any one of claims 1-8, wherein the radiation source assembly comprises a plurality radiation sources.

10. The radiation source module defined in any one of claims 1-9, wherein the optical radiation sensor is disposed adjacent one end of the protective sleeve.

11. A radiation source assembly for use in a radiation source module, the radiation source assembly comprising at least one radiation source and an optical radiation sensor, both of the at least one radiation source and the optical radiation sensor being disposed within a protective sleeve.

12. The radiation source assembly defined in claim 11, wherein the protective sleeve comprises a quartz sleeve.

13. The radiation source assembly defined in any one of claims 11-12, wherein the radiation source module comprises a plurality of radiation source assemblies at least one radiation source assembly comprising the optical radiation sensor disposed within the protective sleeve.

14. The radiation source assembly defined in claim 13, wherein the radiation source module comprises at least one radiation source assembly having no optical radiation sensor.

15. The radiation source assembly defined in any one of claims 11-14, wherein the radiation source assembly comprises a plurality of radiation sources.

16. The radiation source assembly defined in any one of claims 11-15, wherein the optical radiation sensor is disposed adjacent one end of the protective sleeve.

ABSTRACT OF THE DISCLOSURE

A radiation source module for use of fluid treatment system. The radiation source module comprises: a frame having a first support member; at least one radiation source assembly extending from and in engagement with a first support member, the at least one radiation source assembly comprising at least one radiation source disposed within a protective sleeve; and an optical radiation sensor disposed within the protective sleeve. The radiation source module is particularly useful in ultraviolet radiation treatment systems used to disinfect wastewater.

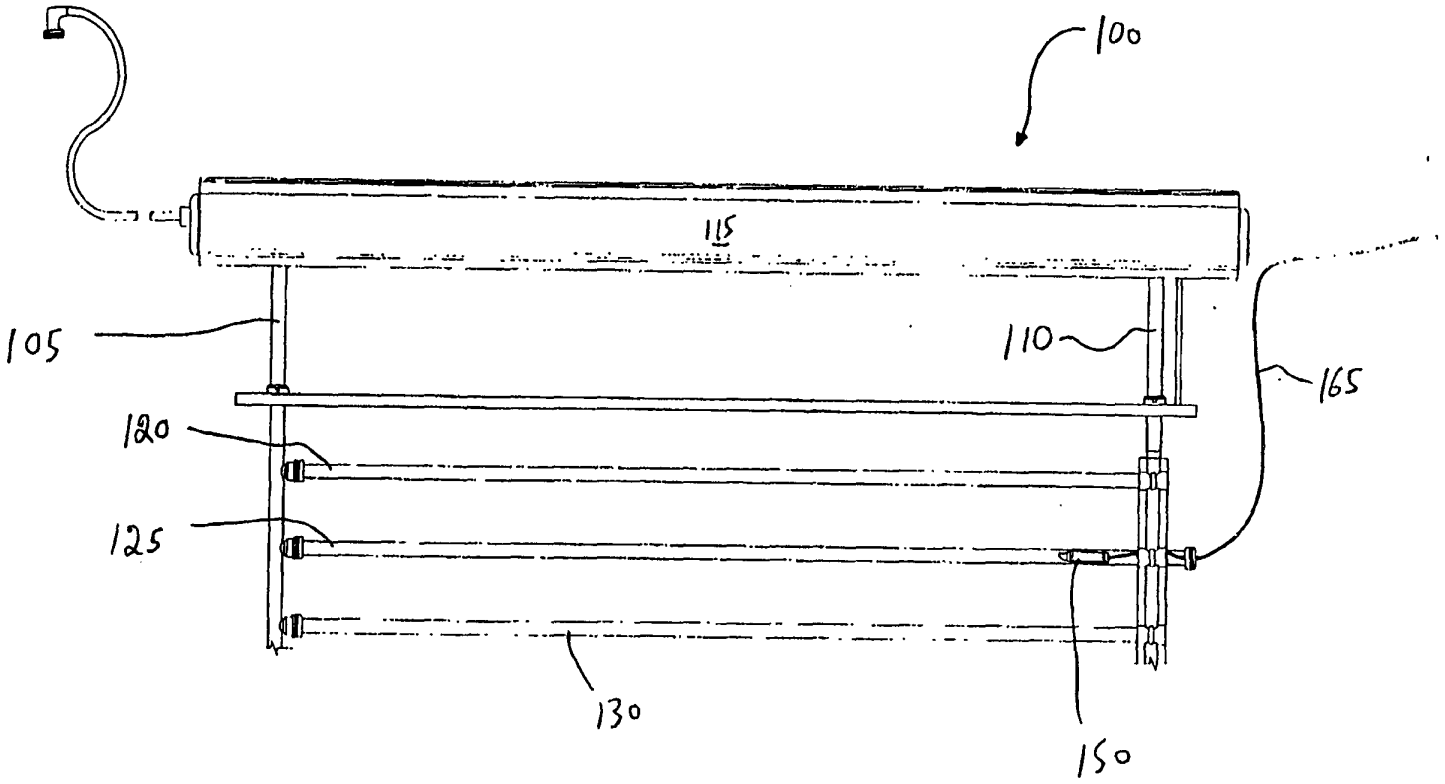

FIG. 1

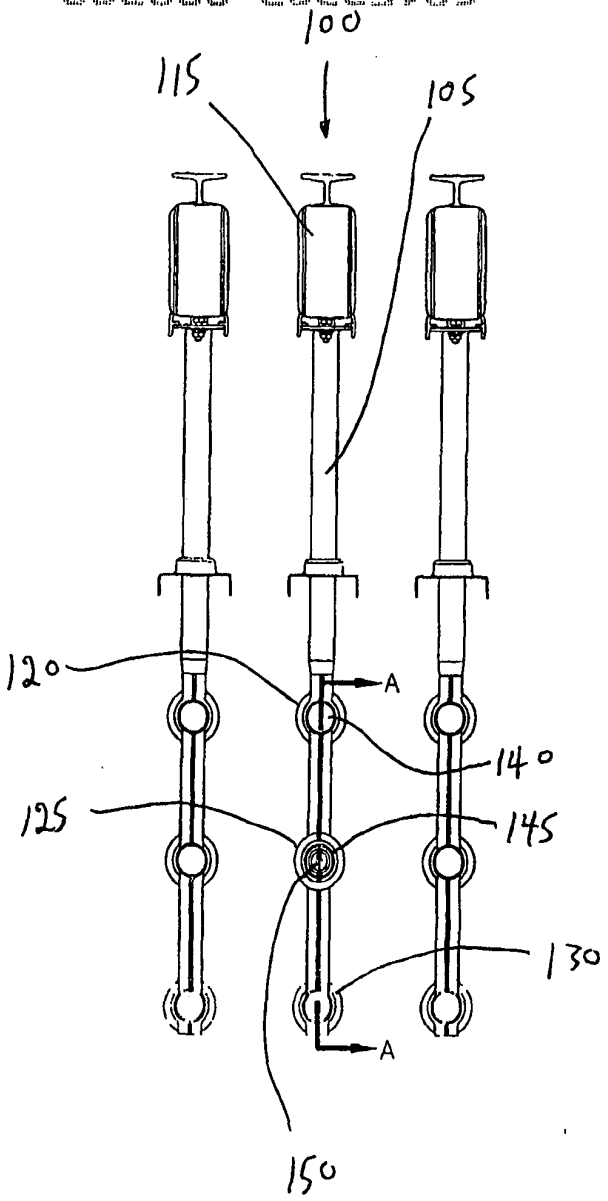

FIG. 2

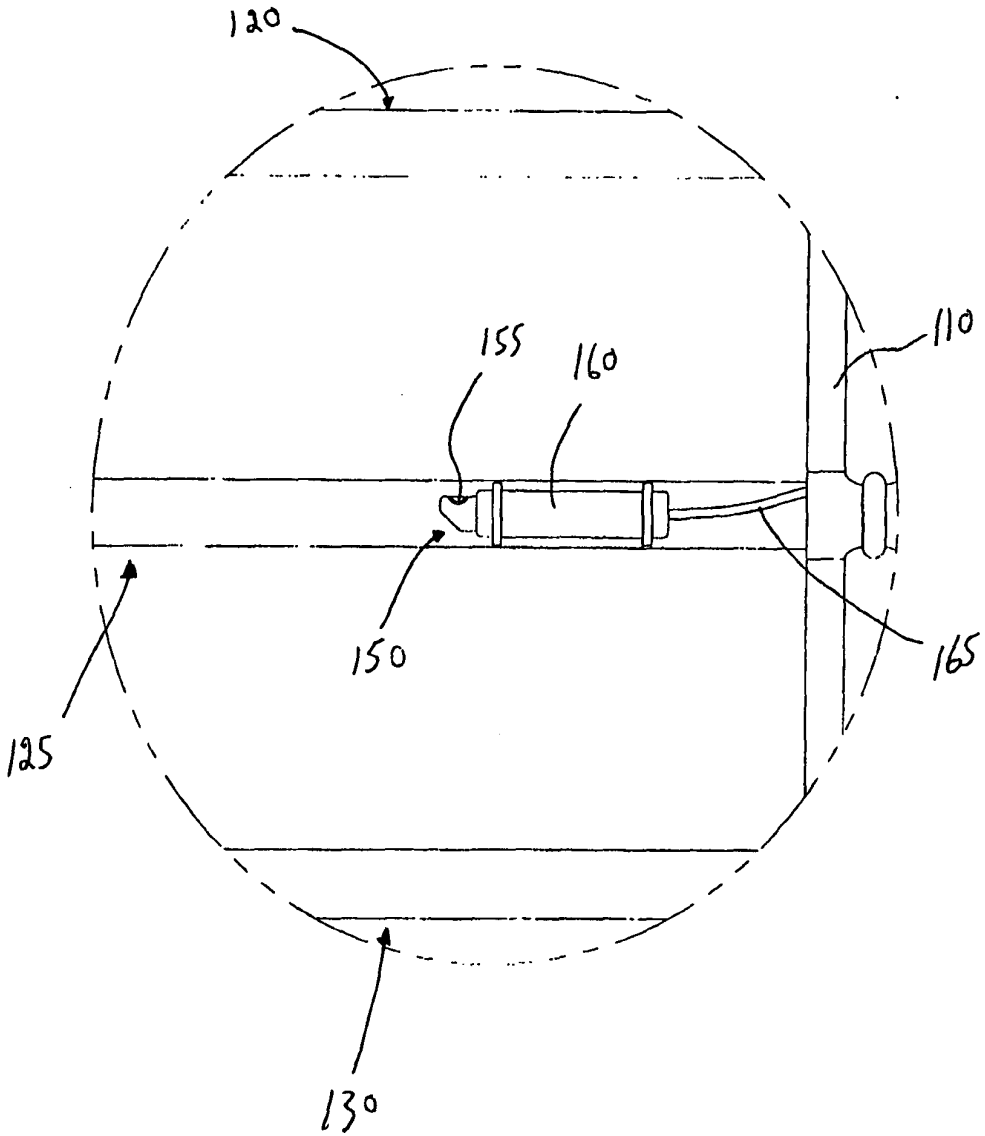

FIG. 3